

RECONSTRUCTIVE VASCULAR SURGERY FOR INTESTINAL ANGINA

by

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THE disastrous consequences of infarction of the bowel are well documented. In an accumulated series of 274 patients from seven major centres up to 1975 the mortality averaged 95 per cent.¹ Baccelli² in 1918 first described the syndrome of chronic intestinal ischaemia manifested by post-prandial pain. It was not until 1933 that Connor³ and Dunphy⁴ linked intestinal angina to chronic visceral artery occlusion and eventual bowel infarction. In 1957, Mickelson⁵ suggested a possible surgical approach in the management of atherosclerotic occlusion of the visceral arteries, and in the following year this proved to be successful.⁶ Intestinal angina, as a syndrome, was slow to be recognised and by 1972 only 92 cases had been reported.⁷ Since then, increasing numbers of cases have been reported, the largest series from the Mayo Clinic incorporating 56 patients treated over a period of 20 years.⁸

We present two cases of intestinal angina and discuss their diagnosis and management.

CASE REPORTS

Case 1 (N.H.). This 55-year-old woman gave a 6-month history of regular postprandial crampy central abdominal pain which commenced 10-15 minutes after meals and lasted 2-4 hours. The pain sometimes progressed into her lower abdomen. If the meal contained a high proportion of fat, diarrhoea followed approximately 30 minutes later. She normally tended to be constipated. Latterly she would spend prolonged periods sitting up and bent over a hot-water bottle which she clutched to her abdomen. She consumed small meals and was afraid to eat. She complained of continuing weight loss approaching 20 kg. She suffered from angina. At the age of 30 she had a hysterectomy and bilateral mastectomies for unknown reasons and there had been no evidence of tumour.

Several studies were done elsewhere to exclude primary gastrointestinal disease but as all investigations, except a liver biopsy which showed some fatty change, proved unhelpful, an exploratory laparotomy was undertaken which was also negative. At this point a vascular surgical opinion was sought.

On examination the patient appeared to have lost weight, was slightly dehydrated, mildly anaemic but haemodynamically stable. Abdominal examination revealed a healed incision but no other abnormal findings and a bruit was not heard.

A diagnosis of chronic progressive mesenteric vascular ischaemia was made and angiographic studies were undertaken (Fig. 1). Lateral views of a transfemoral aortogram showed significant stenotic disease of the coeliac axis and the superior mesenteric artery. The origin of the coeliac axis was almost occluded and the proximal superior mesenteric artery was stenosed. The inferior mesenteric artery was the only patent vessel supplying the gastrointestinal tract. Selective mesenteric angiography was then attempted and in the opinion of the radiologist some element

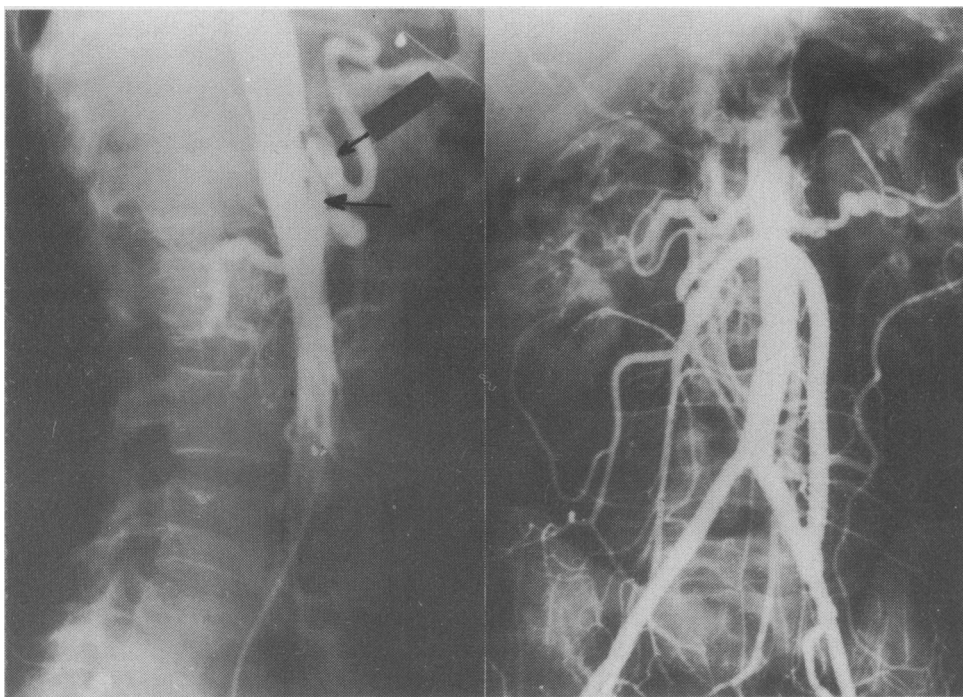


FIG. 1

(Case 1). Lateral aortogram (left) showing high grade stenosis of the coeliac axis and stenosis of the superior mesenteric artery. Postoperative angiogram (right) showing excellent perfusion of superior mesenteric artery via graft arising from left common iliac artery.

of dissection may have occurred due to the grossly arteriosclerotic proximal segment of this artery. Immediately following angiography she was observed to be pale, sweating and hypotensive. The abdomen was soft but there was generalized tenderness, especially in the left upper quadrant with some guarding. Bowel sounds were present but diminished and once again a bruit was not heard.

In view of her history, the confirmed findings of mesenteric artery occlusive disease and the likelihood of further ischaemia complicating angiography, immediately laparotomy was undertaken. A long midline incision was employed and on exposure the whole of the small bowel was pale and rather aperistaltic; pulsation was neither seen nor felt in the mesenteric vessels. The bowel was viable but its arterial blood supply was markedly attenuated. The posterior peritoneum was incised and the duodenum freed by dividing the ligament of Treitz. The proximal part of the superior mesenteric artery was exposed and the presence of blood in the arterial wall confirmed that dissection had occurred, and the distal vessel was pulseless. A 2.5 cm segment of patent vessel distal to this point was exposed and brought under control. Through a small peritoneal incision the left common iliac artery was then exposed, freed and encircled.

A 5-mm USCI Sauvage filamentous vascular prosthesis was preclotted by the method described by Yates et al⁹ and anastomosed obliquely end-to-side to the left common iliac artery using 5/0 Ticron sutures. The graft was brought upwards retroperitoneally to the left of the aorta and then arching across it below the renal arteries in a natural curve downwards in the line of the superior mesenteric artery. Using a 1.5 cm arteriotomy in the superior mesenteric artery a careful oblique end-to-side anastomosis was performed under magnification employing 6/0 Ticron interrupted sutures. On release of vascular clamps, excellent flow was confirmed by pulsation of the superior mesenteric artery and its branches, immediate pinking up of the bowel and a frenzy of peristaltic activity. Using an electromagnetic probe a resting mean flow of 520 cc per minute was recorded (i.e. calculated velocity of approximately 50 cc per second per cm² graft cross-sectional area). A portion of omentum was brought down and tacked over the prosthesis so safeguarding the duodenum.

Postoperatively the patient's recovery was uneventful and she was discharged 11 days later on an antiplatelet regimen of dipyridamole and acetyl salicylic acid. Prior to discharge a confirmatory angiogram illustrated perfect alignment of the graft leading to a now patent superior mesenteric arterial system, the ramifications of which are clearly defined in Fig. 1. She reported complete remission of all her symptoms and after six months had fully regained her weight.

Case 2 (M.T.). A 54-year-old woman gave a 4-month history of postprandial crampy central and upper abdominal pain, especially after ingesting milk or cream. The pain usually commenced one hour after meals and lasted two or three hours, but was unrelated to the size of the meal and was not associated with any bowel disturbance. She admitted to a weight loss of 15 kg. In addition to these symptoms she occasionally complained of back pain and crampy pain in her legs unrelated to exercise. She smoked 20 cigarettes per day and admitted to a family history of cardiac and peripheral vascular disease. Barium meal and cholecystogram were both normal.

By the time of her admission to hospital three months later the patient had essentially stopped eating because even small meals precipitated severe abdominal pain of a degree which rendered her prostrate. On examination a small abdominal aortic aneurysm was palpable, an abdominal bruit was heard and weak femoral pulses were palpated.

A provisional diagnosis of intestinal angina was made and aortography displayed aneurysmal dilatation of the infra-renal abdominal aorta and also revealed the presence of stenosis at the origins of the common iliac vessels (Fig. 2a). A lateral aortogram (Fig. 2b) revealed the presence of stenosis at the origins of both the coeliac axis and the superior mesenteric artery. The origin of the inferior mesenteric artery was occluded but from its distal part a meandering visceral artery or arch of Riolo was noted, particularly in late-phase films (Fig. 2c).

The intensity of her symptoms increased until she was unable to tolerate food, necessitating parenteral nutrition. Because of her rapidly deteriorating condition as well as the presence of the aneurysm, urgent surgery was performed.

On laparotomy through a midline incision, the bowel, both small and large, was dusky blue, congested, immobile and apparently in a pre-gangrenous condition, and

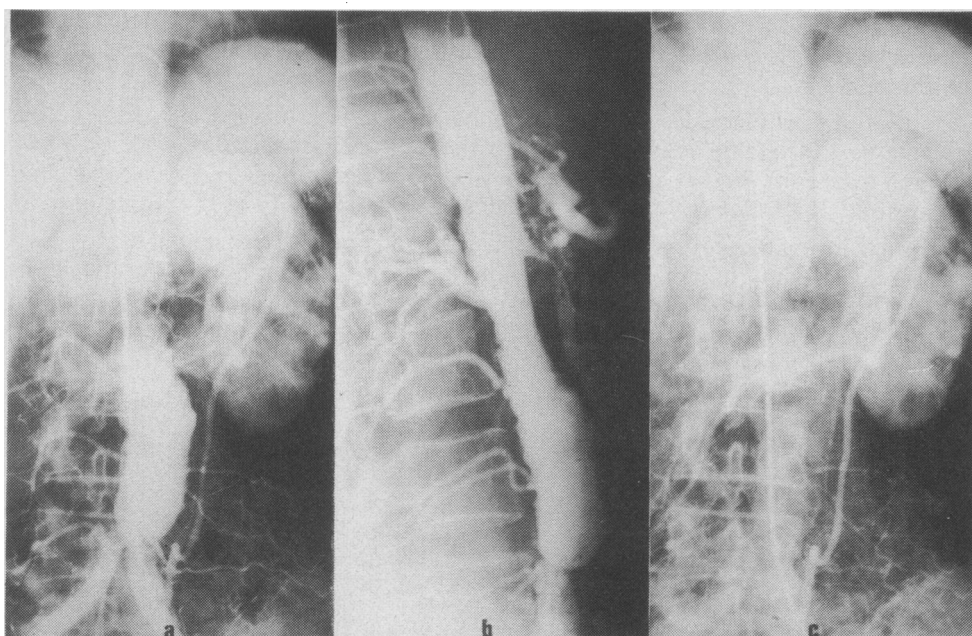


FIG. 2

(Case 2). (a) Aortogram showing the meandering visceral artery or arch of Rioloan arising from the proximally occluded inferior mesenteric artery, the lumen of the abdominal aortic aneurysm and stenosis at the origin of common iliac vessels. (b) A lateral aortogram demonstrating stenosis at the origins of the coeliac axis and superior mesenteric artery, absent inferior mesenteric artery and the lumen of the abdominal aortic aneurysm containing clot anteriorly. (c) Late phase arteriogram demonstrating the meandering visceral artery more clearly.

on palpation mesenteric vessels were not pulsating. The posterior peritoneum was incised. The abdominal aortic aneurysm was over 5 cm in diameter and pulsation in the iliac arteries, especially the right, was only just discernible. It was argued that as the arch of Rioloan was vital to the bowel, then clamping the infra-renal aorta in order to deal with the aneurysm would certainly have endangered the bowel, already in a precarious state of viability. Construction of the left iliac-superior mesenteric bypass, being time-consuming, was done first without compromising flow through the arch of Rioloan. A 3 cm segment of the superior mesenteric artery distal to the occluded segment was exposed and controlled, as was the left common iliac artery.

An 8 mm USCI Sauvage Bionit graft was preclotted⁹ and sutured obliquely end-to-side with 4/0 prolene into a 2 cm arteriotomy in the left common iliac artery. The graft was then directed upwards retroperitoneally across the midline and into a comfortable lie to be anastomosed obliquely end-to-side into a 2 cm arteriotomy in the superior mesenteric artery using 5/0 prolene. The abdominal aortic aneurysm and distal iliacs were then controlled, the aneurysm opened, evacuated of clot and an endarterectomy of the origins of the iliacs performed. The aorta was then

replaced using 14 mm USCI De Bakey woven dacron graft inserted by the inlay technique using 2/0 prolene suture. The prostheses were covered over with posterior peritoneum.

At the end of this procedure most of the bowel was restored to a normal colour and showed peristaltic activity, except for the terminal ileum and right colon which did not appear as vigorously viable. The abdomen was closed and a 'second-look' laparotomy the following day left no doubt as to the viability of the whole bowel.

Her postoperative course was uncomplicated and she was discharged having been established on dipyridamole and warfarin. At review six months postoperatively she was eating normally, was completely asymptomatic and had nearly returned to her normal weight. A postoperative angiogram (Fig. 3) demonstrated a patent functioning iliaco-mesenteric graft.

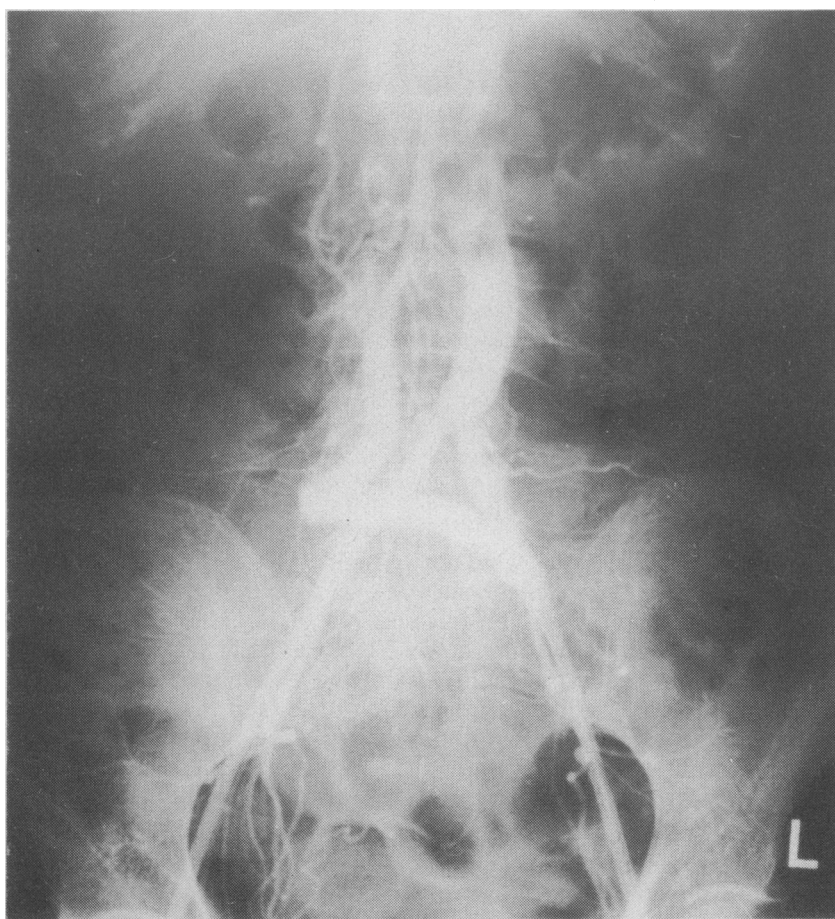


FIG. 3

(Case 2). A postoperative arteriogram demonstrating the aortic graft, the iliaco-mesenteric graft and filling of the superior mesenteric arterial tree.

DISCUSSION

These two patients demonstrate most of the typical clinical symptoms and signs of intestinal angina.^{9, 10} Abdominal pain and weight loss are often the predominant symptoms, each being present in almost 100 per cent of cases. Other associated symptoms may include nausea, vomiting, diarrhoea or constipation. Malabsorption is rare as a presenting feature.^{10, 11} The patient soon realises that food induces the pain. Weight loss has been aptly attributed to 'food fear' and reduced intake of food¹³ and not to malabsorption.

An abdominal bruit, usually audible in these patients, is heard in one of every eight healthy adults,¹² so that its significance may be of dubious value. Evidence of associated cardiovascular disease is common as was observed in both patients described here: in one case angina, in the other an associated abdominal aortic aneurysm and occlusive disease of the iliac vessels. In one series,¹⁰ 50 per cent of patients operated on for intestinal angina also required other vascular reconstructive procedures.

Specific biochemical investigation such as the D-xylose excretion test and serum carotene estimation have been suggested but these are generally unhelpful in making the diagnosis.¹¹ Exclusion of more common postprandial pain syndromes by radiological investigation of the biliary and upper gastrointestinal tract is usually necessary, though in many cases, the clinician may proceed with these studies having failed to recognise the syndrome of intestinal angina in the first instance.

The diagnosis is usually established by contrast angiography, in particular with the aid of a lateral aortogram and selective angiography of the coeliac axis, superior mesenteric artery and, if possible, the inferior mesenteric artery too. These studies will illustrate the classic features of either stenosis or occlusion of at least two or all three major visceral vessels. Lateral aortography is of crucial value for accurate assessment of visceral artery disease. In patients with intestinal angina, arteriosclerotic lesions are usually found to be severe in the proximal segments of these arteries but when angiography is performed for other reasons, the chance discovery of such lesions should not be accorded much significance. In populations where arteriosclerotic disease abounds, disease of these vessels is often noted, but the patient remains asymptomatic, protected by the rich collateral splanchnic circulation. Autopsy studies¹⁴ have revealed stenosis or occlusion of these vessels in the absence of previous gastrointestinal symptoms. The demonstration of the meandering visceral artery or arch of Riolan on arteriography is usually suggestive of visceral artery occlusive disease, indicating the need to obtain a lateral view of the abdominal aorta.¹⁵

Surgical intervention in the management of mesenteric ischaemia first took the form of endarterectomy to restore visceral arterial blood supply.⁶ Today, vascular reconstructive techniques consist mainly of bypass procedures using either a dacron prosthesis or a reversed saphenous vein graft^{13, 15, 16} Endarterectomy has worked quite well, but as a rule, the technique is less efficacious either in terms of initial results or long term graft patency. A vein graft being autogenous with a living endothelial surface and possessing further attributes of compliance and pulsatility, is preferable to a prosthetic graft or endarterectomy and its use is recommended.⁸ On the other hand, donor veins may be diseased, of poor calibre or absent. The predictable qualities of filamentous velour dacron prostheses,^{9, 17, 18} in addition to

their assured calibre sufficient to deliver the large volumes of blood demanded by the gastrointestinal tract are arguments in favour of these grafts. The thoraco-abdominal approach allowing trans-aortic endarterectomy has been advocated,^{19, 20} but by its very nature is likely to be attended by avoidable complications and a higher morbidity. More recently, percutaneous transluminal angioplasty has been used successfully in the treatment of intestinal angina.²¹

Revascularisation of the superior mesenteric artery was performed in both cases reported here by means of a dacron bypass graft originating from the left common iliac artery. This is an excellent high-flow source of blood for such a graft; it is easily approached and controlled, lies in a position convenient for inflow into the bypass graft, which, as in Case 1, can then be positioned entirely retroperitoneally and safely separated from hollow viscera.

The dangers of selective angiography for mesenteric ischaemia are clearly demonstrated by Case 1. Intimal dissection or thrombosis are well recognised complications of arteriography and selective visceral angiography should only be performed in circumstances when a vascular surgeon is prepared to proceed immediately to an emergency operation if required. It is essential in such cases of dissection to proceed expeditiously to surgery as thrombosis and bowel infarction may occur rapidly, especially if the patient is dehydrated as was true in Case 1. It would be quite reasonable and sensible to warn the patient prior to angiography of the possibility of surgery soon after the study.

In the presence of multiple vessel disease the vascular reconstruction of a single vessel will usually relieve symptoms.¹⁰⁻¹² In a recent report,⁸ the incidence of graft failure with recurrence of symptoms or disastrous mesenteric infarction has prompted the authors to recommend reconstruction of two or all three diseased arteries. This advice must be balanced by other considerations, not least of which are the cardiac risk factors, applicable to both cases described here, which militate against prolonged anaesthesia and numerous operations. The urgency with which surgery was performed in both patients, especially in Case 1, denied the preparation necessary to embark on further prolonged bypass procedures.

The major surgery required in Case 2 as a consequence of the additional features of an abdominal aortic aneurysm and common iliac artery occlusive disease could not reasonably have been extended further. The value of the 'second-look' operation to confirm intestinal viability is underlined.

Occlusive disease of the visceral arteries is often noted at arteriography in patients who have no associated symptoms. In a recent report¹⁵ such angiographic evidence of severe occlusive disease in asymptomatic patients has been treated as a risk, leading the authors to perform concomitant prophylactic revascularisation of the intestines during standard aorto-iliac reconstruction. An aggressive approach based on angiography alone should be questioned and is unlikely to gain widespread acceptance.

SUMMARY

The characteristic history and findings in two patients with intestinal angina are presented. The investigation and surgical management of this rare clinical syndrome which is probably under-diagnosed are discussed. A greater awareness of the clinical picture of chronic mesenteric ischaemia and a readiness to perform the appropriate

investigations with a view to surgical revascularisation may avert the disastrous consequences of mesenteric infarction and its considerable attendant mortality.

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